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BIOACTIVITY ON TITANIUM SAMPLES OBTAINED BY POWDER METALLURGY

Ágreda CG, Bressiani AHA
[1] Centro de Ciências e Tecnologia de Materiais (CCTM), Instituto de Pesquisas Energéticas e Nucleares, São Paulo, BRASIL

Titanium and its alloys have been widely used in orthopedic and dental implants materials because of their good properties such as high strength-to-weight ratio, good corrosion resistance in physiological environment, good fatigue resistance and low elastic modulus. However, it is recognized that bioactivity of metal surface is not high enough to be able to bond with bone. For this reason, various surface treatments have been modifying to improve the bioactivity.

The aim of this study was to evaluate and compare the apatite-forming ability in SBF of Ticp subjected to different surface treatments. Titanium hydride powder with mean particle size of 92µm was encapsulated under vacuum in flexible rubber molds and cold isostatically pressed at 200 MPa during 60s. Green bodies were sintered in high vacuum condition at 1400° C/1h with heating rates of 10°C/min. The surface treatments performed were: standard - alkali treatment; 1- alkali and heat treatments; 2- acid and alkali treatments; 3- alkali, $CaCl_{2-}$,heat and hot water treatments. The groups were soaked in SBF for periods of 1 to 21 days in equipment with constant agitation at 36.5°C. The obtained coatings were analyzed by diffuse reflectance spectroscopy on the infrared (DRIFT) and scanning electron microscopy with energy dispersive spectrometry (SEM-EDS) (surface and cross section) for morphology and thickness evaluation.

After 1 day immersion in SBF, all Ti treated samples presented DRIFT spectrum with presence of well defined wide band in the 3000-3600 cm^{-1} region, characteristic of the O-H. Also observed bands of the PO_4^{3}: 562 and 1020 cm^{-1} and characteristic of the CO_3^{2-} ions vibration: 870 and 1450 cm^{-1}. (This indicates the presence of the carbonated apatite). In 1650 cm^{-1} is observed the band of H_2O. Large morphological differences in the formation of calcium phosphates between Ti samples with the evaluated surface treatments may be explained by differences in surface chemistry.

All treatments were effective to promote the bioactivity, however, the standard treatment had the worst performance regarding layer. The treatments 1 and 3 had similar results until the ninth day in SBF immersion. After this period, samples that received the treatment 3 showed higher thickness values when in comparison with samples that received the treatment 1. The treatment 2 showed to be the most promising one because the samples had highest thickness values in all evaluated periods in comparison with others treatments, indicating greater performance.